

**TENEBRIO ANTIFREEZE PROTEINS****ABSTRACT OF THE DISCLOSURE**

A novel class of thermal hysteresis (antifreeze) proteins (THP) that have up to 100 times the specific activity of fish antifreeze proteins has been isolated and purified from the mealworm beetle, *Tenebrio molitor*. Internal sequencing of the proteins, leading to cDNA cloning and production of the protein in bacteria has confirmed the identity and activity of the 8.4 to 10.7 kDa THP. They are novel Thr- and Cys-rich proteins composed largely of 12-amino-acid repeats of cys-thr-xaa-ser-xaa-xaa-cys-xaa-xaa-ala-xaa-thr. At a concentration of 55  $\mu\text{g/mL}$ , the THP depressed the freezing point 1.6°C below the melting point, and at a concentration of ~1 mg/mL the THP or its variants can account for the 5.5°C of thermal hysteresis found in *Tenebrio* larvae. The THP function by an adsorption-inhibition mechanism and produce oval-shaped ice crystals with curved prism faces.